Filter Strip (Acre) 393A

DEFINITION

A strip of grass or other permanent vegetation used to reduce sediment, organics, nutrients, pesticides, and other contaminants.

PURPOSES

1. To remove sediment from runoff from cropland, grazing land, and disturbed areas.
2. To remove sediment in runoff from forestland.
3. To remove nitrogen, phosphorus, pesticide, and pathogen runoff from cropland, grazing land, and urban areas.
4. To remove sediment, organic material, and other pollutants from polluted water as part of an animal waste utilization plan.
5. To remove sediment from runoff and redirect flow toward a riparian forest buffer.
6. To provide wildlife habitat.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies:

1. On cropland at the lower edge of a field or above conservation practices.
2. On fields upgrade of intermittent or perennial streams, ponds, lakes, or sinkholes.
3. In areas requiring pollutant entrapment as part of an animal waste utilization plan.
4. When sediment entrapment is required on forestland.
5. As a riparian forest buffer component.
6. Where there is minimal concern for movement of leachate from the filter toward shallow ground water.

CRITERIA

General Criteria Applicable To All Purposes

Filter strips will be placed only in areas receiving overland laminar (sheet) flow.

The filter strip will be designed to encourage sheet flow and infiltration of run-on water. A method of spreading the effluent across the width of the filter strip will be established, if needed.

Infiltration will be promoted within all filter strip areas unless an immediate ground water concern is evident. Infiltration mechanisms such as detention basins, vegetative barriers, or stone and organic filled trenches can be placed within the filter area perpendicular to the flow gradient. If ground water contamination is a concern, contact the appropriate NRCS technical specialist for design guidance.

Adequate soil drainage, both surface and subsurface, is a necessary component to assure proper functioning of the soil biology and vegetation in the filter strip.

The flow length through the filter strip will be based on the slope, size, and land use of the contributing area; soil and average slope of the filter area; pollutants contained in the runoff; and presence of sensitive land features down-gradient from the filter area.

Pollutant entrapment in filter strips is highly dependent on the conditions, particularly infiltration potential, in the filter area. Flow lengths given in the following tables for specific pollutants have been adjusted for the predominant hydrologic soil group in the filter area.

Landform of the filter area must allow equipment operation for mowing and harvesting the vegetation.

Comply with local, state, and federal regulations. Sections 401 and 404 of the Clean Water Act may apply to filter strips adjacent to water bodies. Local permits and regulations may supersede criteria in this standard.

Pesticide applications on or near filter strips must comply with label restrictions concerning buffer areas and setbacks.

Contaminant source control shall be considered for all purposes of a filter strip. Reducing the total volume and the concentrations of contaminants in the run-on will increase effectiveness of the filter strip.

Filter strips are part of a resource management system for the land being managed. Other conservation practices and management techniques to treat the resources of concern that must be in place before the filter strip can effectively reduce the pollutants in the runoff include: erosion control, nutrient and pest management, waste utilization, and crop rotations.

Additional Criteria For Vegetation (general for all purposes)

Filter strips will be established to suitable grasses and forbes that are adapted to the soil and climate conditions.

Plants selected for filter strips should be actively growing during the expected run-on period.

Plant species must be selected according to the type and quantity of pollutant contained in the run-on and to the growth condition during the time of year that the pollutant can be expected to move as overland flow.

Plant species should be selected that have stiff, upright growth characteristics for flow retardance and pollutant filtering. Plants must remain upright during flow events and be able to withstand sediment accumulation.

Vegetation will be mowed in the filter strip area. Mowing height criteria is given in Table 1 (page 5).

Vigorous vegetation growth must be achieved under normal management situations.

The selected plant species must be compatible with other objectives of the landowner.

Vegetation in the filter strip area will consist of a single species of grass or comprised of a mixture of grasses, legumes, or other forbes.

Established grass vegetation must attain a minimum stem density per square foot. Legume and other forb density must also attain a minimum stem density per square foot. Stem density criteria for specific species is given in Table 1 (page 5).

The recommended vegetation will be selected from Table 1, Planting Table for Grasses and Legumes (page 5).

Vegetation establishment procedures; seeding, liming, and fertilizing; will comply with the practice standard for Critical Area Planting (342).

Shape and prepare a firm seedbed in a manner consistent with environmental concerns and proper functioning of the filter strip. If necessary, shape the site so conventional equipment can be used for preparing the seedbed, seeding, fertilizing, maintenance, and harvesting.

Additional Criteria For Filter Strips To Remove Sediment From Runoff

Filter strips in cropland, grazing land, or disturbed areas will have a minimum length of flow as given in Table 2 (page 6).

Additional Criteria For Filter Strips On Forestland

A forestland filter strip is part of a forestry operation to reduce delivery of sediment and related pollutants from forest harvest trails and landings toward water bodies. The minimum length of flow through undisturbed forest floor is given in Table 3 (page 6).

Longer flow lengths should be used to accommodate high velocity runoff, large contributing areas, and partially concentrated flow situations.

If seeded, the recommended species and mixtures, seeding rate, and stem density will be the same as Table 1 (page 5).

For filter strips that will be maintained in trees or shrubs, refer to the practice standard for Riparian Forest Buffer (393) for design and maintenance guidance.

Additional Criteria For Vegetated (either grass, legume, or forb) Filter Strip Component (Zone 3) Of A Riparian Forest Buffer

Zone 3 will begin at the outer edge of Zone 2 and extend up-gradient a minimum of 20 feet. Additional length may be necessary to accommodate land shaping and harvesting equipment.

Zone 3 is composed of grass, legumes, or forbs, or a combination of the three vegetation types.

Concentrated flow in Zone 3 will be transformed to sheet flow entering Zone 2 by use of mechanisms such as land shaping, vegetative barriers, or constructed water spreaders.

Zone 3 component of a riparian forest buffer will have the minimum length criteria given in Table 4 (page 6).

Additional Criteria For Filter Strips To Remove Nitrogen And Pesticides From Run-On Water

For filter strips with the purpose of removing nitrogen and pesticides contained in runoff water, the following criteria will apply:

Filter strips, areas down-gradient from animal waste spreading, or crop fields with pesticide and fertilizer treatment where nitrogen and pesticides in runoff are a concern will have a minimum flow length as shown in Table 5 (page 6).

Vegetation species will be selected that have high nutrient uptake and biomass production to remove the maximum amount of nitrogen in the harvested material. If legumes are selected as a part of the vegetation mixture, they will be restricted to only deep rooted (greater than 3 feet) species.

Vegetation selected for pesticide removal must have tolerance to the pesticide or be able to quickly recover from effects of the pesticide being entrapped in the filter strip.

Additional Criteria For Filter Strips To Remove Phosphorus From Runoff Water

The filter strip will be designed and constructed to promote infiltration of the run-on water into the soil profile. Infiltration basins, filled trenches or vegetative barriers will be part of the design.

Vegetation species will be selected that have high maximum amount of phosphorus in the harvested material.

Vegetation will be mowed and harvested in the filter strip area. Mowing height criteria is given in Table 1 (page 6).

Filter strips or areas down-gradient from animal waste spreading or crop fields with fertilizer treatment where phosphorus in runoff is a concern will have a minimum flow length as shown in Table 6 (page 6).

Additional Criteria For Filter Strips To Remove Pathogens (bacteria and virus) From Runoff Water

Using filter strips and areas as sole treatment for pathogen removal may not reduce the pathogen counts to levels meeting water quality standards. Other management practices may need implementation.

The filter strip will be designed and constructed to promote infiltration of the run-on water into the soil profile. Infiltration basins, filled trenches, and vegetative barriers will be part of the filter strip design.

Vegetation will be mowed and harvested in the filter strip area. Mowing height criteria is given in Table 1 (page 5).

Filter strips, areas down-gradient from animal waste spreading, pasture, or other organic waste material treatment where pathogens are a concern will have minimum flow lengths as shown in Table 7 (page 6).

Additional Criteria For Wildlife Habitat

Select vegetation species that are compatible to desired wildlife species (see Wildlife Upland Habitat Management Standard 645).

If wildlife habitat is a secondary purpose, do not compromise function or design of the primary purpose.

Multiple drill widths of various grass/forb species are desirable for habitat diversity and cover. For example: a strip planted to orchardgrass, switchgrass, and garrison creeping foxtail.

CONSIDERATIONS

General For All Purposes

1. Consider the effects of seasonal weather variations such as frozen soils, snow cover, and varying ranges of soil moisture on the efficiency of the filter strip.

2. Consider the effects of vegetation on water use and retention with the soil profile.

3. Maintain a balance for the removal or accumulation of nutrients within the soil-plant system of the filter area.

4. Observe the effect on the visual quality onsite and down-gradient from the vegetated filter strip.

5. Be sure the selection and management of the vegetation is consisent with the essential purpose of the vegetated filter strip.

6. Filter strip slopes between 2 and 6 percent are most effective. Steeper slopes require a greater area and length of flow. Shallower slopes cause ponding.

7. The filter should be maintained at the minimum flow length stated in the criteria. The length may be extended if changes occur in the contributing area of the watershed that would increase the amount of runoff or pollutants toward the filter strip.

8. Filter lengths (and widths) should be adjusted to accommodate harvest and maintenance equipment.

9. Provisions for preventing continuous or daily discharge to the vegetated filter strip should be made unless an adequate area for infiltration and soil storage of all applied effluent is provided. Temporary storage or alternate areas for application of the effluent should be considered.

10. For filter areas maintained in trees and shrubs, refer to the practice standard for Riparian Forest Buffer (392).

PLANS AND SPECIFICATIONS

A plan and specifications are to be prepared for each specific field site where a filter strip will be implemented based on this standard. A plan includes information about the location, construction sequence, vegetation establishment, and management requirements. Specifications include size and slope of the filter area; amount and species of vegetation material to be used; as well as the operation and maintenance required assuring that the practice achieves its intended purpose.

OPERATION AND MAINTENANCE

A narrative will be prepared in the plan that will state the required operation and maintenance of the filter strip.

1. Concentrated flow within the filter strip area will be minimized. If concentrated flow occurs, repair and reconstruction will be made immediately to reestablish laminar (sheet) flow. Remove settled solids as much as practicable prior to directing flow to the filter strip.

2. Vegetation in the filter strip will be maintained in a vigorous growing condition. Supplemental application of nutrients will be applied if required by a soil test recommendation or other monitoring procedures. Establish fertilizer needs by soil test results. Apply nitrogen fertilizer after vegetation is established. Fertilize by observation and soil test when needed.

3. The filter strip area will be maintained in the vegetative species that supports the design criteria. Periodic removal or control of undesirable species will be performed by methods that do not hamper the overall performance of the filter strip.

4. The filter strip area shall be inspected on a seasonal basis and following major storm and runoff events. Any damages or sediment accumulation that would adversely impair the function of the filter must be corrected immediately.

5. Periodic tillage and reestablishment of some or all of the filter strip vegetation will be required as needed to remove accumulated sediment. An accumulation of sediment greater than 6 inches or any sediment accumulation that prevents the filter strip from performing as intended - this would be a criterion for removal and/or reestablishment of the affected filter strip area.

6. Vegetative plant density as required by the design criteria shall be maintained. It may require overseeding or other management methods such as clipping and harvesting to promote an adequate density of plant stems.

7. Nutrients that accumulate in the stems and leaves of the plant will be harvested and removed from the site. Periodic foliage harvest or intensive grazing as part of a planned prescribed haying and grazing system may accomplish this.

8. Grazing shall not be permitted in the filter strip unless a planned grazing system is being implemented (see Prescribed Grazing Standard 528A). Grazing will be permitted under planned grazing systems only when soil moisture conditions support animal traffic. Otherwise, livestock will be excluded by whatever means. Limit cattle access and control grazing.

9. Vegetation harvest must be performed on a regular basin to stimulate growth, maintain an upright growth habit, plus provide for removal of nutrients that are contained in the plant tissue.

10. The filter strip area and management will need to be adjusted if management changes occur in the contributing area.

11. Do not use filter strips as a travel way, cropland head land, or lane for livestock or farm equipment.

TABLE 1 - Planting Table for Grasses and Legumes

Recommended species of grasses, legumes, and other forbes.
(Select one of the species or seeding mixes below.)

Species or Seeding Mixture	Cool/ Warm Season	Seeding Rate (Lb./Acre)	Established Density (Stems/Ft^2)	Minimum Mowing Height (In.)	Sediment Trapping	Nutrient Trapping	Wildlife Value
Smooth Bromegrass	Cool	15-30	50	4	Y		
Garrison Creeping Foxtail	Cool	6-10	70	4		Y	
Orchardgrass	Cool	10-15	70	4	Y	Y	Y
Reed Canarygrass	Cool	10	50	4	Y	Y	
Tall Fescue **	Cool	15-25	60	4	Y		
Tall wheatgrass ***	Cool	8-12		6	Y		Y
Prairie Grasses							
Intermediate Wheatgrass	Cool	8-12	60	4	Y		Y
Big Bluestem	Warm	10-20*	40-50	12		Y	Y
Eastern Gamagrass	Warm	8*	40	12	Y	Y	Y
Indiangrass	Warm	10-15*	40-50	12		Y	Y
Switchgrass	Warm	5-10*	50	12	Y		Y
Timothy Alfalfa	Cool	5-10 6-10	60	4	Y	Y	Y
Bromegrass Alfalfa	Cool	6-12 6-10	60	4	Y	Y	Y
Orchardgrass	Cool	2-5 6-10	60	4	Y	Y	Y
Others			50	4			

* Pounds of PLS - Pure Live Seed.
** Do not include tall fescue if area is planned for grazing or forage.
*** Do not include tall wheatgrass with filter strips for forestland applications.

TABLE 2
Filter Strip Length To Remove Sediment From Runoff

Land Slope Percent of Contribution Area (%) Above Filter Strip	Length of Flow (Feet) Hydrologic Soil Group of Filter Area			
	A	B	C	D
0 – 1	20	20	22	24
1 – 3	20	25	28	30
3 – 5	24	30	33	36
5 – 8	28	35	40	42
8 – 12	32	40	44	48
12 - 15	40	50	55	60
15 - 20	48	60	66	72
> 20	*	*	*	*

* For slopes that exceed 20%, consult NRCS technical specialist for design guidance.

TABLE 3
Filter Strip Length Through Undisturbed Forest Floor Forestland

Land Slope Percent of Contributing Area (%) Above Filter Strip	Length of Flow (Feet)
0 - 3	25
3 - 5	35
5 - 8	45
8 - 12	55
12 - 18	65
18 - 30	80
40 - 50	90
50 - 60	120
60 - 70	150
> 70	*

* For slopes that exceed 70%, consult NRCS technical specialist for design guidance.

TABLE 4
Filter Width For Zone 3 Vegetation In A Riparian Forest Buffer

Land Slope Percent of Contributing Area (%) Above Filter Strip	Length of Flow (Feet)
0 - 8	20
9 - 15	30
> 15	40

TABLE 5
Filter Length For Areas Subject To Run-On Of Nitrogen and Pesticides

Land Slope Percent of Contribution Area (%) Above Filter Strip	Length of Flow (Feet) Hydrologic Soil Group of Filter Area			
	A	B	C	D
0 – 1	24	30	33	36
1 – 3	32	40	44	48
3 – 5	40	50	55	60
5 – 8	48	60	66	72
8 – 12	56	70	77	84
12 - 15	72	90	100	108
> 15	*	*	*	*

* For slopes that exceed 15%, consult NRCS technical specialist.

TABLE 6
Filter Length For Areas Subject To Run-On Of Phosphorus

Land Slope Percent of Contribution Area (%) Above Filter Strip	Length of Flow (Feet) Hydrologic Soil Group of Filter Area			
	A	B	C	D
0 – 1	24	30	33	36
1 – 3	40	50	55	60
3 – 5	56	70	77	84
5 – 8	72	90	100	108
8 – 12	96	120	132	144
12 - 15	120	150	165	180
> 15	*	*	*	*

* For slopes that exceed 15%, consult NRCS technical specialist.

TABLE 7
Filter Length For Areas Subject To Run-On Of Pathogens (Bacteria and Virus)

Land Slope Percent of Contribution Area (%) Above Filter Strip	Length of Flow (Feet) Hydrologic Soil Group of Filter Area			
	A	B	C	D
0 – 1	20	25	28	30
1 – 3	24	30	33	36
3 – 5	32	40	44	48
5 – 8	48	60	66	72
8 – 12	100	125	137	150
12 - 15	144	180	198	216
> 15	*	*	*	*

* For slopes that exceed 15%, consult NRCS technical specialist.